

IN THE CLAIMS:

Claims 1-36 (Cancelled)

1 37. (Currently Amended) A direct oxidation fuel cell, comprising

2 (A) a catalyzed membrane electrolyte, having an anode aspect and a cathode

3 aspect;

4 (B) a fuel cell housing enclosing said fuel cell with an anode chamber being

5 defined between said anode aspect of the catalyzed membrane electrolyte and an exterior

6 portion of said cell housing, said fuel cell housing also including a cathode chamber be-

7 ing defined between said catalyzed membrane electrolyte and an exterior portion of said

8 fuel cell housing, opposite said anode chamber;

9 (C) a direct fuel feed into said anode chamber that has no liquid exit port such

10 that liquid that is present in said anode chamber cannot exit said anode chamber except

11 across said catalyzed membrane electrolyte;

12 (D) at least one [[open]] gaseous effluent release port in said anode chamber,

13 which is in substantially direct gaseous communication with the ambient environment

14 [[allowing effective release of anodically-generated gaseous effluent]] , to vent gaseous

15 product of an electricity-generating reaction from said [[fuel cell]] anode chamber to the

16 ambient environment, and not into said cathode chamber, as said [[gaseous effluent]]

17 gaseous product is generated; and

18 (E) a load coupled across said fuel cell, providing a path for electrons pro-

19 duced in electricity generating reactions of said fuel cell.

1 38. (Previously Presented) The direct oxidation fuel cell as defined in claim 37

2 wherein a substance delivered by said direct fuel feed into a liquid-closed volume in the

3 anode chamber is up to 100% fuel.

- 1 39. (Previously Presented) The direct oxidation fuel cell as defined in claim 38
- 2 wherein said fuel is methanol.
- 1 40. (Previously Presented) The direct oxidation fuel cell as defined in claim 37
- 2 wherein fuel is delivered by said direct fuel feed into said anode chamber without anode
- 3 liquid recirculation.
- 1 41. (Previously Presented) The direct oxidation fuel cell as defined in claim 37
- 2 wherein water produced at said cathode is not actively collected or pumped to said anode
- 3 chamber.
- 1 42. (Currently Amended) The direct oxidation fuel cell as defined in claim 37
- 2 wherein gaseous product [[effluent]] traveling out of said fuel cell through said gaseous
- 3 effluent release port is at least partially comprised of carbon dioxide.
- 1 43. (Previously Presented) The direct oxidation fuel cell as defined in claim 37
- 2 wherein at least a portion of one wall of said anode chamber is gas permeable and liquid
- 3 impermeable.
- 1 44. (Currently Amended) A direct oxidation fuel cell, comprising:
 - 2 (A) a catalyzed membrane electrolyte having an anode aspect and a cathode
 - 3 aspect;
 - 4 (B) a fuel cell housing with an anode chamber being defined between said an-
 - 5 ode aspect of said catalyzed membrane electrolyte and an exterior portion of said cell
 - 6 housing, and fuel being delivered to, but not actively recirculated from, said anode cham-
 - 7 ber, said fuel cell housing also including a cathode chamber being defined between said
 - 8 catalyzed membrane electrolyte and an exterior portion of said fuel cell housing, opposite
 - 9 said anode chamber; and
 - 10 (C) a gaseous anodic product removal component disposed between said cata-
 - 11 lyzed membrane electrolyte and at least a portion of the interior wall of the anode cham-

12 ber for effective release by venting [[of]] anodically generated [[gaseous effluent]]. gase-
13 ous product of an electricity-generating reaction substantially directly to the ambient en-
14 vironment, and not into the cathode chamber.

1 45. (Currently Amended) A direct oxidation fuel cell system, comprising:

2 (A) a direct oxidation fuel cell having:

3 (i) a catalyzed membrane electrolyte, having an anode aspect and a
4 cathode aspect;

5 (ii) a fuel cell housing enclosing said fuel cell with an anode chamber
6 being defined between said anode aspect of the catalyzed membrane electrolyte and an
7 exterior portion of said cell housing, said fuel cell housing also including a cathode
8 chamber being defined between said catalyzed membrane electrolyte and an exterior por-
9 tion of said fuel cell housing, opposite said anode chamber;

10 (iii) a direct fuel feed into an anode chamber, having no liquid exit,
11 such that fuel that enters into the anode chamber by the direct fuel feed cannot exit the
12 anode chamber except across said catalyzed membrane electrolyte; and

13 (iv) at least one [[open]] gaseous effluent release port located in said
14 anode chamber in close proximity to said anode aspect of the catalyzed membrane elec-
15 trolyte, which is in substantially direct gaseous communication with the ambient envi-
16 ronment and through which anodically generated [[gaseous effluent]]. gaseous product of
17 an electricity reaction [[is allowed]] is vented and [[to be]] released from said [[fuel cell
18 housing]] anode chamber as it is generated, and not into the cathode chamber;

19 (B) a fuel source coupled to said anode chamber; and

20 (C) means by which current can be collected from the fuel cell and conducted
21 to a load, whereby electricity is generated by said fuel cell as fuel is delivered to said an-
22 ode chamber without external pumping of cathodically-generated water and without ac-
23 tive water removal elements.

1 46. (Currently Amended) A direct oxidation fuel cell, comprising:

2 (A) a catalyzed membrane electrolyte assembly having an anode aspect and a
3 cathode aspect and

4 (B) means for outporting [[gasses]] gaseous product of an electricity generat-
5 ing reaction away from the anode aspect of the fuel cell substantially directly to the am-
6 bient environment through an anode chamber and not into a cathode chamber which
7 means for outporting gasses is disposed in close proximity to said anode aspect of the
8 catalyzed membrane electrolyte assembly.

1 47. (Withdrawn) A gas management component for use in a direct oxidation fuel
2 cell having a catalyzed membrane electrolyte with an anode aspect and a cathode aspect,
3 comprising:

4 an element substantially comprised of a gas-permeable, liquid-
5 impermeable material, which element is disposed in close proximity to the anode aspect
6 of the catalyzed membrane electrolyte assembly.

1 48. (Withdrawn) The gas management component as defined in claim 47 wherein
2 said material is gas-selective in such a manner that it is permeable to anodic effluent gas,
3 but is substantially less permeable to oxygen.

1 49. (Withdrawn) The gas management component as defined in claim 47 wherein
2 said gas management component is made part of a flow field element, providing said
3 flow field element with gas releasing properties while effectively delivering fuel to active
4 area of the membrane electrolyte.

1 50. (Withdrawn) The gas management component as defined in claim 49 wherein
2 fuel is delivered to said active area of the membrane electrolyte through an associated
3 anodic diffusion layer.

1 51. (Withdrawn) The gas management component as defined in claim 49 wherein
2 said flow fields encourage removal of anodically-generated gasses such that they are re-
3 leased from the direct oxidation fuel cell prior to excessive collection of gaseous anodic
4 product within the said anode chamber in said fuel cell.

1 52. (Withdrawn) The gas management component as defined in claim 47 wherein
2 said gas management component is disposed within said fuel cell in such a manner that
3 anodically-generated gasses are released prior to coalescing and impeding the flow of
4 fuel from an associated fuel source into said anode chamber.

1 53. (Withdrawn) A membrane electrode assembly of a direct oxidation fuel cell,
2 comprising:
3 (A) a protonically-conductive, electronically non-conductive catalyzed mem-
4 brane electrolyte;
5 (B) a catalyst disposed on said membrane electrolyte;
6 (C) an anode diffusion layer disposed contiguous to an anode aspect of the
7 membrane electrolyte;
8 (D) a cathode diffusion layer disposed contiguous to a cathode aspect of the
9 membrane electrolyte; and

10 (E) a gas-permeable, liquid-impermeable layer coupled to, or in close prox-
11 imity with said anode diffusion layer.

1 54. (Withdrawn) The membrane electrode assembly as defined in claim 53 wherein
2 said gas-permeable, liquid-impermeable layer is mechanically attached or bonded to said
3 anode diffusion layer.

1 55. (Currently Amended) A direct oxidation fuel cell comprising:

2 (A) a membrane electrode assembly, including:

3 (i) a protonically-conductive, electronically non-conductive catalyzed
4 membrane electrolyte;
5 (ii) a catalyst disposed on said membrane electrolyte;
6 (iii) an anode diffusion layer disposed contiguous to an anode aspect of
7 the membrane electrolyte;

8 (iv) a cathode diffusion layer disposed contiguous to a cathode aspect
9 of the membrane electrolyte; and

10 (B) a gas-permeable, liquid-impermeable layer for releasing [[gaseous anodic
11 product]] anodically generated gaseous product of an electricity-
12 generating reaction as it is generated and is vented to the ambient envi-
13 ronment and not into said cathode chamber, coupled in proximity to said
14 anode diffusion layer; and

15 (C) a coupling across said fuel cell to conduct electricity generated by said
16 fuel cell to an associated load; and

17 (D) a fuel cell housing substantially enclosing said fuel cell.

1 56. (Currently Amended) A direct oxidation fuel cell system, comprising:

2 (A) a fuel source;

3 (B) a direct oxidation fuel cell including:

4 (i) a protonically-conductive, electronically non-conductive catalyzed
5 membrane electrolyte;

- 6 (ii) a catalyst disposed on said membrane electrolyte;
- 7 (iii) an anode diffusion layer disposed contiguous to the anode aspect
- 8 of the membrane electrolyte;
- 9 (iv) a cathode diffusion layer disposed contiguous to the cathode aspect
- 10 of the membrane electrolyte; and
- 11 (v) a gas-permeable, liquid-impermeable layer [[for releasing gaseous
- 12 anodic product]] coupled in proximity to said anode diffusion
- 13 layer, for releasing anodically generated gaseous product of an
- 14 electricity-generating reaction to an ambient environment and not
- 15 into said cathode chamber; and
- 16 (vi) a coupling across said fuel cell to conduct electricity generated by
- 17 said fuel cell to an associated load.

1 57. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 56 wherein the fuel is up to 100% fuel.

1 58. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 57 wherein said fuel is methanol.

1 59. (Withdrawn) A method of managing anodic effluent in a direct oxidation fuel
2 cell, said fuel cell having a catalyzed membrane electrolyte with an anode aspect and a
3 cathode aspect, the method including the step of:

removing gaseous anodic effluent from a liquid by providing a gas management component comprised substantially of a gas-permeable, liquid-impermeable layer disposed in close proximity to the anode aspect of the direct oxidation fuel cell.

1 60. (Withdrawn) The method, as defined in claim 59, including providing said gas-
2 permeable, liquid-impermeable layer in contact with the anode aspect of the membrane
3 electrolyte assembly.

1 61. (Withdrawn) A method of separating anodically-generated gasses in a direct
2 oxidation fuel cell, said fuel cell having a catalyzed membrane electrolyte with an anode
3 aspect and a cathode aspect, and an anode chamber being defined between said anode
4 aspect and an exterior of said fuel cell, the method including the steps of:

5 separating said anodically-generated gasses from a fluid volume of fuel contained
6 within said anode chamber of said fuel cell, without recirculating said volume of fuel.

1 62. (Previously Presented) A direct oxidation fuel cell system, comprising:

2 (A) a fuel source;

3 (B) a direct oxidation fuel cell having a catalyzed membrane electrolyte with
4 an anode aspect and a cathode aspect;

5 (C) a cell housing with an anode chamber defined between the anode aspect of
6 the catalyzed membrane and one exterior portion of said cell housing, with said chamber
7 having no exit port for liquid; and

8 (D) an element disposed between said fuel source and said anode aspect of the
9 direct oxidation fuel cell for controlling the delivery of fuel to the anode aspect of the
10 membrane electrolyte.

1 63. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62, wherein said element controls the delivery of fuel without pumps or active recircula-
3 tion mechanisms.

1 64. (Withdrawn) The direct oxidation fuel cell system as defined in claim 62 wherein
2 said fuel source is substantially entirely disposed within said fuel cell.

1 65. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein
3 said fuel source is disposed external to the fuel cell.

1 66. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein

3 a pressure differential exists between the fuel in the fuel source and the anode
4 chamber of the fuel cell.

1 67. (Withdrawn) The direct oxidation fuel cell system as defined in claim 62 wherein
2 said element for controlling fuel delivery includes a pump.

1 68. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein

3 said fuel source contains more than one liquid that may be mixed between the fuel
4 source and the anode of the fuel cell.

1 69. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 68 wherein

3 said fuel source contains methanol and water.

1 70. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein

3 said fuel source is capable of delivering up to 100% fuel to said fuel cell.

1 71. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 70 wherein said fuel is methanol.

1 72. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein

3 delivery of said fuel is performed by suction.

1 73. (Previously Presented) The direct oxidation fuel cell system as defined in claim
2 62 wherein

3 said delivery by suction is performed by the action of a capillary network in a po-
4 rous component, which is disposed between said fuel source and said anode of said direct
5 oxidation fuel cell.

1 74. (Withdrawn) A method of delivering fuel to a direct oxidation fuel cell compris-
2 ing the steps of delivering fuel to the anode of the fuel cell in such a manner that the vol-
3 ume of fuel that has been consumed at the anode of the fuel cell is replaced by the same
4 volume of fresh fuel or a fuel and water mixture delivered from a fuel source.

1 75. (Withdrawn) A method of controlling delivery of fuel to a direct oxidation fuel
2 cell system wherein said fuel cell system includes a fuel source, a direct oxidation fuel
3 cell having a catalyzed membrane electrolyte with an anode aspect and a cathode aspect
4 and an anode chamber being defined between said anode aspect and an exterior portion of
5 said direct oxidation fuel cell, said anode chamber not having a port by which liquid can
6 exit the anode chamber, the method including the steps of:

7 providing a mass transport controlling element disposed between the anode aspect
8 of the catalyzed membrane and said fuel source whereby fuel delivery to the fuel cell sys-
9 tem is controlled without pumps or recirculation components.

1 76. (Withdrawn) The method as defined in claim 75 including the further step of
2 disposing said fuel source entirely within said fuel cell.

1 77. (Withdrawn) The method as defined in claim 75 including the further step of
2 disposing said fuel source external to the fuel cell.

1 78. (Withdrawn) The method as defined in claim 75 including the further step of
2 placing fuel in said fuel source under a slight pressure to induce a pressure differ-
3 ential between the fuel in said fuel source and the fuel in the anode chamber of the fuel
4 cell.

1 79. (Withdrawn) The method as defined in claim 75 including the further step of
2 providing in said fuel source more than one liquid; and
3 mixing said liquids between the fuel source and the anode chamber of the fuel
4 cell.

1 80. (Withdrawn) The method as defined in claim 79 wherein said liquids provided to
2 said fuel source include methanol and water.

1 81. (Withdrawn) The method as defined in claim 75 including providing as said fuel,
2 a substance of up to 100% methanol.

1 82. (Withdrawn) The method as defined in claim 81 wherein said fuel substance is
2 methanol.

1 83. (Withdrawn) The method as defined in claim 75 including the further step of de-
2 livering said fuel to said anode chamber by suction.

1 84. (Withdrawn) The method as defined in claim 75 including the further step of de-
2 livering fuel from said fuel source to said anode by the suction action of a capillary net-
3 work in a porous component that is disposed between said fuel source and said anode
4 chamber of said direct oxidation fuel cell.

1 85. (Withdrawn) A method of delivering fuel to a direct oxidation fuel cell, in-
2 cluding the steps of:
3 (A) providing a direct oxidation fuel cell including a catalyzed
4 membrane electrolyte, having an anode aspect and a cathode aspect; and

5 (B) providing a fuel to said anode aspect of said catalyzed mem-
6 brane electrolyte, said fuel comprising concentrated methanol

1 86. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 50% methanol, by weight.

1 87. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 60% methanol, by weight.

1 88. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 70% methanol, by weight.

1 89. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 80% methanol, by weight.

1 90. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 90% methanol, by weight.

1 91. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 95% methanol, by weight.

1 92. (Withdrawn) The method according to claim 85 wherein said fuel comprises at
2 least about 99% methanol, by weight.

1 93. (Withdrawn) The method of delivering fuel as defined in claim 85 including the
2 further step of providing water to said anode aspect from a water source that is separate
3 from said fuel source.

1 94. (Withdrawn) A method of delivering fuel to a direct oxidation fuel cell, including
2 the steps of:

3 (A) providing a direct oxidation fuel cell including a catalyzed mem-
4 brane electrolyte, having an anode aspect and a cathode aspect; and
5 (B) providing a fuel to said anode aspect of said catalyzed membrane elec-
6 troltye, said fuel consisting essentially of methanol.

1 95. (Withdrawn) A method of delivering fuel to a direct oxidation fuel cell, includ-
2 ing the steps of:

3 (A) providing a direct oxidation fuel cell including a catalyzed mem-
4 brane electrolyte, having an anode aspect and a cathode aspect; and
5 (B) providing a fuel to said anode aspect of said catalyzed membrane elec-
6 troltye, said fuel consisting essentially of concentrated methanol.

1 96. (Currently Amended) A direct oxidation fuel cell, comprising:

2 (A) a catalyzed membrane electrolyte, having an anode aspect and a
3 cathode aspect wherein said anode aspect has no liquid exit, and anodically generated
4 gaseous product of an electricity-generating reaction is vented to the ambient environ-
5 ment as it is generated through an element coupled in close proximity to said anode as-
6 pect, and said anodically generated gaseous product is not vented across said membrane
7 electrolyte into a cathode chamber;

8 (B) a fuel source for providing fuel to said anode aspect, wherein
9 said fuel comprises concentrated methanol; and

10 (C) a load coupled across said fuel cell, providing a path for elec-
11 trons produced in electricity-generating reactions of said fuel cell.

1 97. (Currently Amended) A direct oxidation fuel cell, comprising:

2 (A) a catalyzed membrane electrolyte, having an anode aspect and a
3 cathode aspect, and wherein said anode aspect has no liquid exit, and anodically generated
4 gaseous product of an electricity-generating reaction is vented to the ambient envi-
5 ronment as it is generated through an element coupled in close proximity to said anode
6 aspect, and said anodically generated gaseous product is not vented across said mem-
7 brane electrolyte into a cathode chamber;

8 (B) a fuel source for providing fuel to said anode aspect, wherein
9 said fuel consists essentially of concentrated methanol; and

10 (C) a load coupled across said fuel cell, providing a path for elec-
11 trons produced in electricity-generating reactions of said fuel cell.

1 98. (Currently Amended) A direct oxidation fuel cell system, comprising:

2 (A) a direct oxidation fuel cell having:

3 (i) a catalyzed membrane electrolyte, having an anode aspect
4 and a cathode aspect, and wherein said anode aspect has
5 no liquid exit, and anodically generated gaseous product
6 of an electricity-generating reaction is vented to the am-
7 ambient environment as it is generated through an element
8 coupled in close proximity to said anode aspect, and said
9 anodically generated gaseous product is not vented across
10 said membrane electrolyte into a cathode chamber:

11 (ii) a source of fuel, said fuel comprising concentrated metha-
12 nol for providing fuel to said anode aspect;

13 (B) a fuel cell housing enclosing said fuel cell; and

14 (C) a load coupled across said fuel cell by which current can be col-
15 lected from the fuel cell.

99. (Currently Amended) A direct oxidation fuel cell system, comprising:

2 (A) a direct oxidation fuel cell having:

3 (i) a catalyzed membrane electrolyte, having an anode aspect

4 and a cathode aspect, and wherein said anode aspect has

5 no liquid exit, and anodically-generated gaseous product

6 of an electricity-generating reaction is vented to the am-

7 ambient environment as it is generated through an element

8 coupled in close proximity to said anode aspect, and said

9 anodically generated gaseous product is not vented across

10 said membrane electrolyte into a cathode chamber;

11 (ii) a source of fuel, said fuel consisting essentially of con-

12 centrated methanol for providing fuel to said anode as-

13 pect;

14 (B) a fuel cell housing enclosing said fuel cell; and

15 (C) a load coupled across said fuel cell by which current can be col-

16 lected from the fuel cell.

1 100. (Withdrawn) A method of delivering fuel to a direct oxidation fuel cell, including
2 the steps of:
3 (A) providing a direct oxidation fuel cell including a catalyzed mem-
4 brane electrolyte, having an anode aspect and a cathode aspect; and
5 (B) providing fuel to said anode aspect from a source of fuel having
6 a methanol concentration greater than the 1:1 ratio of methanol:water required by the
7 electrochemical reaction at said anode aspect.

1 101. (Currently Amended) A direct oxidation fuel cell, comprising:
2 (A) a catalyzed membrane electrolyte, having an anode aspect and a
3 cathode aspect, and wherein said anode aspect has no liquid exit, and anodically-
4 generated gaseous product of an electricity-generating reaction is vented to the ambient

5 environment as it is generated through an element coupled in close proximity to said
6 anode aspect, and said anodically generated gaseous product is not vented across said
7 membrane electrolyte into a cathode chamber;

8 (B) a source of fuel having a methanol concentration greater than the
9 1:1 ratio of methanol:water required by the electrochemical reaction at the anode aspect
10 for providing fuel to said anode aspect; and

11 (C) a load coupled across said fuel cell, providing a path for elec-
12 trons produced in electricity-generating reactions of said fuel cell.

1 102. (Currently Amended) A direct oxidation fuel cell system, comprising:

2 (A) a direct oxidation fuel cell having:

3 (i) a catalyzed membrane electrolyte, having an anode aspect
4 and a cathode aspect, and wherein said anode aspect has no liquid
5 exit, and anodically-generated gaseous product of an electricity-
6 generating reaction is vented to the ambient environment as it is
7 generated through an element coupled in close proximity to said an-
8 ode aspect, and said anodically generated gaseous product is not
9 vented across said membrane electrolyte into a cathode chamber;
10 and

11 (ii) a source of fuel having a methanol concentration greater
12 than the 1:1 ratio of methanol:water required by the electrochemical re-
13 action at said anode aspect for providing fuel to said anode aspect;

14 (B) a fuel cell housing enclosing said fuel cell; and

15 (C) a load coupled across said fuel cell by which current can be col-
16 lected from the fuel cell.